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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/761,009	01/20/2004	Joong S. Jeon	0180154	3709

25700 7590 07/26/2005

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EXAMINER
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PHAM, LONG

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/761,009	JEON ET AL.	
	Examiner	Art Unit	
	Long Pham	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-6,8,9 and 11-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6,8,9 and 11-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. ____   |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____  | 6) <input type="checkbox"/> Other: ____                                     |

## DETAILED ACTION

### Rejections and/or objections necessitated by the amendments

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. Claims 1, 2, 4, 5, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over En et al. (US patent 6,563,183) in combination with Kim (US publication 2005/0048765).

With respect to claim 1, En et al. teach a method of forming a field-effect transistor on a substrate said method comprising step of (see associated text in cols. 5-7):

forming a buffer layer on a substrate, said buffer layer comprising a ALD silicon dioxide; and

forming a high-k dielectric layer over said buffer layer.

With respect to claims 2 and 6, En et al. further teach forming a gate electrode of polysilicon over said high-k dielectric layer.

Further with respect to claim 1, En et al. fail to teach that the silicon dioxide ALD layer is formed using  $\text{SiCl}_4$  precursor.

Kim teaches forming a Silicon dioxide ALD using  $\text{SiCl}_4$  precursor. See [0042].

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate Kim's teaching into the process of Un et al. because the use of ALD allows the formation of silicon dioxide.

With respect to claim 4, Since En et al. in view of Kim teaches claimed process of forming claimed buffer layer, the formed buffer layer would inherently comprise substantially no pin-hole defects.

With respect to claim 5, En et al. further teach the buffer layer having a thickness of 5.0 to 7.0 Angstroms but fail to teach claimed range of 5.0 Angstroms or less.

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However, a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985).

Further with respect to claim 1, the use of hafnium oxide as high-k dielectric is well-known in the art.

2. Claims 8, 9, 11, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over En et al. (US patent 6,563,183) in combination with Kim (US publication 2005/0048765).

With respect to claim 8, En et al. teach a method for forming a field effect transistor on a substrate said method comprising a step of forming a buffer layer on said substrate, said method being characterized by:  
forming a high-k dielectric layer on said buffer layer, wherein said buffer layer comprises ALD silicon dioxide.

With respect to claims 9 and 13, En et al. further teach forming a gate electrode of polysilicon over said high-k dielectric layer.

Further with respect to claim 8, En et al. fail to teach that the silicon dioxide ALD layer is formed using SiCl<sub>4</sub> precursor.

Kim teaches forming a silicon dioxide ALD using SiCl<sub>4</sub> precursor. See [0042].

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate Kim's teaching into the process of Un et al. because the use of ALD allows the formation of silicon dioxide.

With respect to claim 11, Since En et al. in view of Kim teaches claimed process of forming claimed buffer layer, the formed buffer layer would inherently comprise substantially no pin-hole defects.

With respect to claim 12, En et al. further teach the buffer layer having a thickness of 5.0 to 7.0 Angstroms but fail to teach claimed range of 5.0 Angstroms or less.

However, a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985).

Further with respect to claim 8, the use of hafnium oxide as high-k dielectric is well-known in the art.

### ***Response to Arguments***

3. Applicant's arguments with respect to claims 1-2, 4-6, 8-9, and 11-13 have been considered but are moot in view of the new ground(s) of rejection.

In response to the applicant's arguments in the second full paragraph on page 6 of the Amendment dated 05/13/05, it is submitted that the fact that the applicants have a different reason or advantage resulting from doing what the relied prior art suggested doing is not indicative or demonstrative of unobviousness. In *Re Kronig* 190 USPQ 425,428 (CCPA 1976); In *Re Lintner* 173 USPQ 560 (CCPA 1972). Further, it is submitted that it has been held that a reference may suggest doing what an applicant has done even though those of ordinary skill in the art were ignorant of the existence of the problem. In *re Gershon*, 152 USPQ 602 (CCPA 1967).

In response to the applicant's arguments in the first paragraph on page 7 of the Amendment dated 05/13/05, it is submitted that Kim does not teach away from use of an ALD layer in conjunction with high-k dielectric because Kim is being relied on only for the teaching that ALD silicon dioxide is formed using  $\text{SiCl}_4$  precursor and En et al. teach forming high k dielectric over the ALD silicon dioxide. See the rejection.

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Applicant's failure to challenge the well-known statements recited in previous rejections confirms the validity of the those statements.

***Conclusion***

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 571-272-1714. The examiner can normally be reached on M-F, 7:30AM-3:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Long Pham

Primary Examiner

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LP